

App. No. 10/792,003

Reply to Office action of April 25, 2006

Amendments to the Claims:

1. (currently amended) A ~~nickel based alloy for use as a coating for a superalloy~~  
substrate, the coating comprising:

a first coating layer formed on the substrate and having a composition represented by the formula MCrAlYX wherein M comprises at least one member of the group consisting of Ni, Co, and Fe, and X comprises Pt and at least one member of the group consisting of Hf, Si, Zr, Ta, Re, and Ru, the weight percentage of X to the total composition being within the range of about 0.1% to about 28.0; and

at least one additional coating layer on either side of the first coating layer, wherein the at least one additional coating layer includes a modified MCrAlY that does not include Pt

Al is included at up to about 15% by weight; and

X comprises at least four members of the group consisting of Pt, Hf, Si, Zr, Ta, Re, and Ru; and wherein the weight percentage of X to the total composition is being within the range of about 0.1% to about 28.0%.

2. (currently amended) The ~~nickel based alloy coating~~ according to claim 1 wherein the weight percentage of X to the total composition is within the range of about 0.5% to about 15.0%.

3. (currently amended) The ~~nickel based alloy coating~~ according to claim 1 wherein the weight percentage of X to the total composition is within the range of about 1.0% to about 7.0%.

App. No. 10/792,003

Reply to Office action of April 25, 2006

4. (currently amended) The ~~nickel-based alloy~~ coating according to claim 1 wherein M comprises at least one member of the group consisting of Ni and Co.

5. (currently amended) The ~~nickel-based alloy~~ coating according to claim 1 wherein M comprises Ni/Co alloy.

6. (currently amended) The ~~nickel-based alloy~~ coating according to claim 1 wherein M comprises Ni.

7 to 9. (canceled).

10. (previously presented) A nickel based powder composition for use in depositing a coating on a superalloy substrate, the nickel based powder composition having the following ingredients and weight percentages:

Element	Range Weight %
Co	about 15 - about 22
Cr	about 15- about 25
Al	about 8- about 15
Y	about 0.1- about 1.0
Pt	about 20- about 35
Hf	about 1.0- about 5.0
Si	about 1.0- about 5.0
Zr	0 - about -3.0
Ta	0 - about 5.0
Re	about 1.0- about 5.0
Ru	about 1.0- about 5.0
Ni	remainder.

11. (canceled).

App. No. 10/792,003

Reply to Office action of April 25, 2006

12. (previously presented) The nickel based powder composition according to claim 42 having the following ingredients and weight percentages:

Element	Weight %
Co	about 20
Cr	about 25
Al	about 13
Y	about 0.3
Hf	about 2.0
Si	about 0.65
Re	about 3.0
Ni	remainder.

13. (previously presented) The nickel based powder composition according to claim 42 having the following ingredients and weight percentages:

Element	Weight %
Co	about 20
Cr	about 22
Al	about 13
Y	about 0.3
Hf	about 2.0
Si	about 0.65
Re	about 3.0
Ru	about 1.5
Ni	remainder.

App. No. 10/792,003

Reply to Office action of April 25, 2006

14 to 15. (canceled).

16. (previously presented) A nickel based powder composition for use in depositing a coating on a superalloy substrate, the nickel based powder composition having the following ingredients and weight percentages:

Element	Range Weight %
Co	about 15 - about 22
Cr	about 15 - about 25
Al	about 8 - about 15
Y	about 0.1 - about 1.0
Hf	about 1.0 - about 5.0
Si	about 1.0 - about 5.0
Zr	about 1.0 - about 3.0
Ta	about 1.0 - about 5.0
Re	about 1.0 - about 5.0
Ru	about 1.0 - about 5.0
Ni	remainder.

17. (canceled).

18. (original) A method for applying a coating to a turbine blade surface comprising:

providing to the turbine blade surface a powder alloy represented by the formula  $M\text{CrAlYX}$  wherein M wherein comprises at least one member of the group consisting of Ni, Co and Fe;

X comprises at least one member of the group consisting of Pt, Hf, Si, Zr, Ta, Re, and Ru; and wherein the weight percentage of X to the total composition is within the range of about 0.1% to about 28.0%; and

bonding the powder alloy to a turbine blade surface as a coating through laser powder fusion welding.

19. (original) The method according to claim 18 wherein the weight percentage of X to the total composition is within the range of about 0.5% to about 15.0%.

20. (original) The method according to claim 18 wherein the weight percentage of X to the total composition is within the range of about 1.0% to about 7.0%.

21. (original) The method according to claim 18 wherein the step of bonding the powder further comprises laser welding with a direct diode, Nd:YAG, fiber, or  $\text{CO}_2$  laser.

22. (previously presented) The method according to claim 18 further comprising the step of grinding the turbine blade surface with the coating bonded thereto.

App. No. 10/792,003

Reply to Office action of April 25, 2006

23. (previously presented) The method according to claim 22 further comprising the step of grinding the turbine blade surface with the coating bonded thereto such that the turbine blade reaches a preferred dimension.

24. (original) The method according to claim 18 wherein said bonding step results in a metallurgical bond between the substrate and the MCrAlYX coating.

25. (original) The method according to claim 18 further comprising the step of depositing the powder alloy on the turbine blade in more than one layers through a series of more than one deposition steps.

26. (original) The method according to claim 18 wherein said bonding step uses a laser with power between about 50 to about 2500 watts.

27. (original) The method according to claim 18 wherein said bonding step uses a laser with power between about 50 to about 1500 watts.

28. (original) The method according to claim 18 wherein the step of providing powder further comprises providing powder at a powder feed rate of about 1.5 to about 20 grams per minute.

29. (original) The method according to claim 18 wherein the step of providing powder further comprises providing powder at a powder feed rate of about 1.5 to about 10 grams per minute.

App. No. 10/792,003

Reply to Office action of April 25, 2006

30. (previously presented) A method for preparing a coated high pressure turbine blade for assembly in a gas turbine engine comprising the steps of:

providing a suitable turbine blade having a tip to be coated;

grit blasting the turbine blade;

verifying a laser weld path on the turbine blade tip with a video camera;

providing at the turbine blade tip a powder alloy represented by the formula  $\text{MCrAlYX}$  wherein M wherein comprises at least one member of the group consisting of Fe, Ni, and Co; and wherein X comprises at least one member of the group consisting of Pt, Hf, Si, Zr, Ta, Re, and Ru; and wherein the weight percentage of X to the total composition is within the range of about 0.1% to about 28.0%;

laser welding the powder alloy to the turbine blade tip in a layer

checking the depth of the welded layer;

repeating the steps of laser welding and checking the depth until a desired coating thickness is achieved;

grinding the turbine blade tip; and

inspecting the turbine blade through FPI inspection or X-Ray inspection.

31. (currently amended) A method for depositing a modified  $\text{MCrAlY}$  coating onto a superalloy substrate in multiple layers comprising the steps of:

depositing a first layer of Pt-including modified  $\text{MCrAlY}$  onto the superalloy substrate;  
and



App. No. 10/792,003

Reply to Office action of April 25, 2006

depositing a second layer of modified MCrAlY on top of the first layer, wherein the second layer does not include Pt.

32 to 33. (canceled).

34. (currently amended) A coated turbine blade comprising:

an airfoil having a convex face and a concave face;

a base assembly attached to said airfoil;

a tip at the outer radial end of the airfoil; and

a coated region on the tip wherein the coated region comprises:

a first coating layer formed on the substrate and having a composition represented by the formula MCrAlYX, wherein M comprises at least one member of the group consisting of Ni, Co, and Fe, ~~Al is included at up to about 15% by weight,~~ X comprises a combination of at least Pt, Hf and Si, and the weight percentage of X to the total composition is within the range of about 0.1% to about 28.0%, and

at least one additional coating layer on either side of the first coating layer, wherein the at least one additional coating layer includes a modified MCrAlY that does not include Pt.

35. (original) The turbine blade according to claim 34 wherein said MCrAlYX coating has a thickness of up to approximately 0.050 inch.

App. No. 10/792,003

Reply to Office action of April 25, 2006

36. (original) The turbine blade according to claim 34 wherein said MCrAlYX coating has a thickness of up to approximately 0.020 inch.

37. (canceled).

38. (original) The turbine blade according to claim 34 wherein said coating has a thickness of up to approximately 0.020 inch after post-welding grinding.

39. (original) The turbine blade according to claim 34 wherein said coating provides resistance to oxidation and corrosion.

40. (original) The turbine blade according to claim 34 wherein said airfoil further comprises a superalloy.

41. (currently amended) A nickel based powder composition for use in depositing a coating on a superalloy substrate as a coating comprising:

a composition represented by the formula MCrAlYX,

wherein M comprises at least one member of the group consisting of Ni, Co, and Fe, Al is included at up to about 15% by weight, X comprises a combination of at least Pt, Re, Ru, Hf and Si, and the weight percentage of X to the total composition is within the range of about 0.1% to about 28.0%.

42. (canceled).

App. No. 10/792,003

Reply to Office action of April 25, 2006

43. (currently amended) The turbine blade according to claim 34 wherein X further comprises at least one element from the group consisting of Zr and Ta ~~Pt, Zr, Ta, Re, and Ru.~~